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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/553,963	10/19/2005	Makoto Ashiura	21713-00055-US1	9985
30678 7590 10/23/2007 CONNOLLY BOVE LODGE & HUTZ LLP 1875 EYE STREET, N.W. SUITE 1100 WASHINGTON, DC 20036			EXAMINER LEE, RIP A	
			ART UNIT 1796	PAPER NUMBER
			MAIL DATE 10/23/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

**Application No.**

10/553,963

**Applicant(s)**

ASHIURA ET AL.

**Examiner**

Rip A. Lee

**Art Unit**

1796

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 August 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 7-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 7-14 is/are rejected.
- 7) ☒ Claim(s) 1, 6-9 and 11 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_

### DETAILED ACTION

This office action follows a response filed on August 16, 2007. Claims 1 and 2 were amended. Claims 4 and 5 were canceled, and new claims 7-14 were added. Claims 1-3 and 7-14 are pending. Applicant is notified that the status identifier for claims 4 and 5 needs to be corrected in subsequent communication(s).

#### *Claim Objections*

1. Claim 1 is objected to because of the following informalities: In line 3, please delete "in the molecule" (used to denote the modified conjugated diene based polymer) because the term is superfluous and confusing, especially in light of the ensuing phrase, "in an amount of 0.001 to 2 molecules," which is used to denote the fullerene. Appropriate correction is required.
2. Claim 1 is also objected to because of the following informalities: The syntax in line 5 is poor. Please insert "and present" between "more" and "in an amount." Appropriate correction is required.
3. Claim 1 is objected to because of the following informalities: Please move numerical label "(i)" to line 7 and between "reacting" and "the growing" because the numerical labels indicate the components that are reacted, rather than what is being polymerized. Appropriate correction is required.
4. Claims 1, 7-9, and 11 are objected to because of the following informalities: Please remove the article "the" which appears prior to "growing terminal anions" since the latter phrase lacks sufficient antecedent basis in the claims. Appropriate corrections are required.
5. Claims 1, 7-9, and 11 are objected to because of the following informalities: Please replace "an anion" with "anionic." Appropriate corrections are required.
6. Claim 6 is objected to because of the following informalities: Please change claim dependency since claim 6 still depends from canceled claim 5.

***Claim Rejections - 35 USC § 103***

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. Claims 1, 2, 7, 9, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoxmeier (U.S. 5,270,394) in view of Lakshmanan (U.S. 3,923,722).

The prior art of Hoxmeier teaches end-capping and coupling of the reactive terminus of anionically polymerized polymers of styrene, butadiene, isoprene, or mixtures thereof (col. 2, lines 20-23), with a fullerene. A styrene-butadiene block copolymer is an example a copolymer comprised of a mixture of the recited monomers (approx 34 wt % styrene, see example 2). The molecular weight of the polymers lies in the range of 500 to 500,000 (col. 4, line 24). The polymer/fullerene products are believed to be linear (1 polymer arm/fullerene) or star shaped (2-20 polymer arms/fullerene), with a ratio of 0.05-1 fullerene/chain (col. 6, line 28). In another example, the ratio of polymer to fullerene lies in the range of 1-10, corresponding to 0.01-1 fullerene/chain (col. 6, line 64). Note that these ratios lie squarely within the claimed range. Hoxmeier contemplates use of novel polymers in adhesives (col. 5, lines 37-40). The reference does not disclose use of filler.

Lakshmanan discloses adhesive compositions made from styrene-butadiene block copolymer. The inventor discloses that conventional adhesive formulations of this type contain tackifier and calcium carbonate in amounts of 20-125 wt % and 60-500 wt %, respectively (claim 1). As is known in the art, calcium carbonate is used to imparts structural integrity to, as well as to modify the viscosity of, the adhesive.

It would have been obvious to one having ordinary skill in the art to make an adhesive using the polymer composition disclosed in Hoxmeier because the inventor contemplates this end use, and one of ordinary skill in the art would have found it obvious to include calcium carbonate in order to impart structural integrity to, and to modify the viscosity of, the adhesive. Since Lakshmanan teaches this well-known practice, one of ordinary skill in the art would have expected the combination of teachings to produce a useful adhesive.

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9. Claims 1-3 and 7-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoxmeier in view of Nakajima *et al.* (JP 59-12948).

The discussion of the disclosures of the prior art of Hoxmeier from the previous paragraph of this office action is incorporated here by reference. Hoxmeier contemplates use of novel polymers in blends with other thermoplastics for molding applications (col. 5, lines 37-40). The reference is silent with respect to curing, and it is silent regarding the details of preparation of these blends

Nakajima *et al.* teaches a polyblend comprising styrene-butadiene copolymer and EPDM which is extruded and cured. In order to carry out curing, sulfur is used as the vulcanizing agent in an amount of about 2.5 parts by weight (table 3). As is known in the art, curing affords a dimensionally stable material with improved mechanical strength.

It would have been obvious to one having ordinary skill in the art to make a molded composition out of Hoxmeier's polymers because the inventor contemplates this end use, and one of ordinary skill in the art cure the rubber with a similar amount (about 2.5 parts by weight) of vulcanizing agent to accomplish this step. One of skill in the art would have been motivated to increase the mechanical strength of the rubber by vulcanization, especially where polymers are formed into extruded articles. Since Nakajima *et al.* teaches this conventional process, the skilled artisan would have expected the combination of teachings to work with a reasonable expectation of success.

Hoxmeier is also silent with respect to use of reinforcing filler, however, one of skill in the art would have found it obvious to incorporate filler in order to improve the strength of the rubber composition because Nakajima *et al.* teaches incorporation of about 30-150 parts of carbon black filler in order to accomplish this goal. One of ordinary skill in the art would have found it obvious to use carbon black filler in the composition of Hoxmeier because Nakajima *et al.* shows that practice is well-known in the art for improving physical strength of rubber compositions.

10. Claims 1-3 and 7-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoxmeier in view of Lukich *et al.* (U.S. 5,750,615).

Hoxmeier contemplates use of novel polymers in blends with other thermoplastics for molding applications (col. 5, lines 37-40). The reference is silent with respect to the details of preparation of these blends.

Lukich *et al.* teaches a rubber composition comprising 100 phr of diene-based elastomer and 30-100 phr of reinforcing filler containing 5-100 wt % of fullerene and 0-95 wt % of carbon black and/or precipitated silica (claim 1). The diene-based elastomer may be synthetic copolymer rubber, such as styrene-butadiene rubber having a bound styrene content of 20-45 % (col. 6, lines 53-58). While fullerene is added as reinforcing filler, it provides the added benefit of lowering the amount of internal heat generated, which leads to reduced level of thermal breakdown of the composition.

According to one aspect of the invention, fullerenes may have surface modifications such as a functional group substitution to enhance reinforcement properties (col. 2, lines 17-20). To this end, the inventors contemplate incorporation of functional groups such as amine, thiol, and alkanol and reacting a linking moiety to form a resin black matrix within the polymer network (col. 14, lines 23-28). However, the inventors do not provide sufficient teaching to carry out these contemplated embodiments.

One of ordinary skill in the art, having both references at hand, would have found it obvious to use the fullerene terminated styrene-butadiene copolymer taught by Hoxmeier in the composition of Lukich *et al.* because Lukich *et al.* contemplates embodiments in which fullerene is covalently attached to the matrix polymer. In fact, one of ordinary skill in the art would have found it obvious to modify the invention of Lukich *et al.* because Hoxmeier's synthesis of fullerene covalently bound to styrene-butadiene copolymer is facile and conveniently carried out under ambient conditions. Furthermore, one of skill in the art would have expected fewer complications with respect to dispersion using Hoxmeier's composition because it obviates the need to introduce polar functional groups into the system. Therefore, in light of insufficient guidance in Lukich *et al.* regarding synthetic details, one of ordinary skill in the art would have

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found it obvious to use the polymers of Hoxmeier in the compositions of Lukich *et al.*, and he would have expected, with reasonable expectation of success, the combination to result in formation of a well-dispersed fullerene containing rubber composition. The combination of teachings is obvious because both relate to fullerene containing rubber compositions, and because Hoxmeier provides an elegant solution to an otherwise vague synthetic problem presented in Lukich *et al.*

### ***Response to Arguments***

11. Applicant traverses the rejection of claims over Mano (JP 2002-253703). Applicant has indicated that the reference does not teach the composition of the instant claims because the method by which the composition is prepared is different compared with the method recited in the amended claims.

Although instant claims are presented in product-by-process format, it is the examiner's position that the method by which the claimed invention is prepared, gauged against the method of preparation of compositions in the general field of fullerene containing polydiene formulations, results in significant structural difference in the base composition. Therefore, the product-by-process limitation has been given due patentable weight in comparing the instant invention against the prior art.

Further elucidation of Mano is instructive. The reference discloses a composition prepared by compounding high *cis*-polybutadiene and fullerene (fullerene/diene ratio is about 0.7) in the presence of crosslinking agent. Based on the observation that compositions containing fullerene as filler show a higher restitution coefficient than those in which diphenyl disulfide is used as crosslinker, it is postulated that fullerene may be participating in a crosslinked state as a result of radical chain reactions, however, the details of the reaction mechanism remains unclear. From a synthetic standpoint, Mano's compositions are clearly different from those of the instant invention. And while fullerenes may be covalently attached to the polymer matrix, there is no guarantee that the fullerene/diene ratio of 0.7 reflects that due to covalently bound fullerene. These facts taken together, lead to the conclusion that the instant invention, as described in the amended claims, is patentably distinct over Mano.

Consequently, the rejection has been withdrawn.

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Applicant also traverses the rejection of claims over Lukich *et al.* (U.S. 5,750,615). Applicant has indicated that the reference does not teach the composition of the instant claims because the method by which the composition is prepared is different compared with the method recited in the amended claims. The main embodiment of Lukich *et al.* is a conventional rubber tire formulation in which at least a portion of carbon black is replaced with fullerene. Thus, fullerene is physically blended into a polydiene matrix. Clearly, this represents an entirely different composition than that presented in the instant claims. Lukich *et al.* contemplates an embodiment in fullerene could be covalently attached to the elastomer (by introducing polar functional groups), however, the exact details of how this is achieved is not disclosed. This point notwithstanding, one skilled in the art would have found it patently clear that what is proposed is structurally disparate from the claimed invention, where fullerenes are used to terminate a growing chain of an anionically polymerized polydiene. These facts taken together, lead to the conclusion that the instant invention, as described in the amended claims, is patentably distinct over Lukich *et al.*

Consequently, the rejection has been withdrawn.

### ***Conclusion***

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.



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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rip A. Lee whose telephone number is (571)272-1104. The examiner can be reached on Monday through Friday from 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu S. Jagannathan, can be reached at (571)272-1119. The fax phone number for the organization where this application or proceeding is assigned is (571)273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <<http://pair-direct.uspto.gov>>. Should you have questions on the access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).

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October 17, 2007

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